HW-1

1.2) 3) Compute 4 point DFT $Y[k] = DFT\{y[n]\}$

$$y[n] = [2, -3, -3, 2]$$

$$Y[0] = (2\times1) + (-3\times1) + (-3\times1) + (2\times1) = -2$$

$$Y[1] = (2\times1) + (-3\times -j) + (-3\times -1) + (2\times j) = -1 + 5j$$

$$Y[2] = (2\times1) + (-3\times -1) + (-3\times 1) + (2\times -1) = 0$$

$$Y[3] = (2\times1) + (-3\times j) + (-3\times -1) + (2\times -j) = -1 - 5j$$

4) Show that $Y[k] = X_1[k]\,X_2[k]$

$$Y[k] = [-2, -1+5j, -6, -1-5j]$$

$$\begin{cases} X_1[k] = [-1, 1+2j, 3, 1-2j] \\ X_2[k] = [2, 3-j, 0, 3+j] \end{cases}$$

$$[-2, 3+6j-j-2j^2, 0, 3-6j+j-2j^2]$$

$$[-2, -2j^2+5j+3, 0, -2j^2-5j+3]$$

$$[-2, -1+5j, -6, -1-5j] = [-2, -1+5j, -6, -1-5j]$$

1.3) Find Impulse Response for the following 2D signals

1) $H(z_1, z_2) = 1 - a_1 z_1^{-1} - a_2 z_2^{-1} - a_3 z_1^{-1} z_2^{-1} - a_4 z_1^{-1} z_2^{-1}$

2) $H(w_1, w_2) = 1 - 2\cos(w_1) - 2\cos(w_2)$

1) $x[n_1, n_2] = \delta[n_1, n_2] - \delta[n_1 - 1, n_2] - \delta[n_1, n_2 - 1] - \delta[n_1 - 1\ n_2 - 1] - \delta[n_1, n_2 - 1]$

2) $x[n_1, n_2] = \frac{1}{2\pi^2} \int_{-\pi}^{\pi}\int_{-\pi}^{\pi} X(w_1, w_2)\, e^{j(w_1 n_1 + w_2 n_2)}\, 2\cos(w_1) \cdot 2\cos(w_2)$